PROJECT FACT SHEET

CONTRACT TITLE: Advanced Synthetic Diamond Drill Bit Technology (PARTNERSHIP)

DATE REVIEWED: 08/04/1994 **DATE REVISED:** 08/04/1994

OBJECTIVE: Develop advanced synthetic-diamond drill bit technology for reducing the cost of drilling hard sedimentary formations.

ID NUMBER: FEW 2836.700

B & R CODE: AC0530000

CONTRACTOR: Sandia National Lab

ADDR: Department 6111

Albuquerque, NM 87185

CONTRACT PERFORMANCE PERIOD:
06/01/1992 to 06/30/1994
PROGRAM: Supporting Research
RESEARCH AREA: Drilling

CONTRACT PROJECT MANAGER:

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PROJECT SITE:
Sandia, Albuquerque, NM
Dennis Tool Co., Houston, TX
Smith International, Houston, TX

SCHEDULED MILESTONES:

Develop and publish complete two-year program plan.	09/93
Complete the contracting process with each of the companies in the program.	10/93
Complete a full three-dimensional thermal and mechanical stress model of the Dennis Tool Co./DBS claw cutter.	02/94
Initiate single-cutter wear testing of the claw cutter.	02/94
Complete a field test at Catoosa Test Facility, measuring downhole dynamic conditions and correlating them to bit cutter failure and rock type.	03/94
Complete the design and construction of a new single-cutter test machine more closely simulating drilling conditions.	09/94
Initiate single-cutter linear force testing of the track-set cutter configuration.	06/94
Complete single-cutter wear testing of the TSP cutters.	09/94

FUNDING (1000'S)	DOE	OTHER	CONTRACTOR	TOTAL
PRIOR FISCAL YRS	330	30	0	360
FISCAL YR 1994	236	275	94	605
FUTURE FUNDS	0	0	0	0
TOTAL EST'D FUNDS	566	305	94	965

PROJECT DESCRIPTION: Eight drill bit companies have teamed with Sandia Labs to work for five projects as part of a cooperative effort to advance the state of the art in synthetic-diamond drill bit design and manufacture. The objective of each project is to develop advanced bit technology that results in new commercial products with longer bit life and higher penetration rates in hard formations. Each project explores a different approach to synthetic-diamond cutter and bit design and, consequently, use different approaches to developing the technology. Each of these approaches builds on the respective companies' capabilities and current product interests. Sandia's role is to assure integration of the individual projects into a coherent program and to provide unique testing and analytical capabilities where needed.

PRESENT STATUS: In 5/92, a project was initiated to develop a joint industry/national lab program in the drilling area. From 5/92 to 8/93, detailed budgets, work statements, and an overall program plan were finalized, the program was favorably reviewed, and funding was approved and received. Final contracts were placed with each of the companies and the program was begun in October 1993.

ACCOMPLISHMENTS: Significant accomplishments have been made in each of the five projects thus far in FY94.

1) Four benchmarking studies documenting the performance and limitations of current synthetic-diamond and roller cone bits have been completed.
2) During FY93 a method was developed for wear-testing synthetic-diamond cutters in hard rock.
3) A new cutter wear testing machine was designed and is currently being fabricated which can handle the high loads associated with rock cutting and more closely simulates actual drilling.
4) HCC has made a great deal of progress in the development of optimized impregnated diamond drill bits.
5) A method for mounting a variety of TSP cutter sizes and styles for single-cutter wear testing was developed.
6) Characterization and prioritization of field-worn and failed cutters was initiated.
7) A three-dimensional analysis of both the thermal and mechanical stress in a baseline claw cutter was completed.
8) A machine for performing linear cuts with single PDC cutters was obtained and installed.

BACKGROUND: Significant reductions in the costs of drilling for petroleum resources can be achieved in suitable rock formations with the use of polycrystalline diamond compact (PDC) drill bits. PDC bits are susceptible to damage in hardrock stringers and in fractured or inhomogeneous rock formations that impose shock loading. Hard-rock formations also cause frictional heating and thermally accelerated wear on PDC bits. Two applications would benefit with a suitable hard-rock PDC bit: (1) exploratory and reservoir extension drilling where unknown and often hard or fractured formations are routinely encountered, and (2) infill drilling through known hard-rock stringers.